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OPERATING SYSTEM-1: (GATE 2022) - REPORTS

OVERALL ANALYSIS | COMPARISON REPORT | SOLUTION REPORT

ALL(17) | CORRECT(12) | INCORRECT(5) | SKIPPED(0)

Q. 11 FAQ | Solution Video | Have any Doubt ?

Consider a file system that uses inodes to represent files. Disk blocks are 12 KB in size and a pointer to a disk block required 64 bits. This file system has 12 direct disk blocks, as well as single and double indirect disk blocks. The maximum approx size of a file that can be stored in this file system is

A 24 GB

B 27 GB — Your answer is Correct

Solution :
(b)

Given, DBA = 64 bits = 8 bytes
DB size = 12 KB

$$\text{Maximum size of a file system} = \left[\text{Number of direct DBA} + \frac{\text{DB size}}{\text{DBA}} + \left(\frac{\text{DB size}}{\text{DBA}}\right)^2\right] \times \text{DB size}$$

$$\Rightarrow \left[12 + \frac{12 \times 2^{10}\text{B}}{8\text{B}} + \left(\frac{12 \times 2^{10}\text{B}}{8\text{B}}\right)^2\right] \times 12 \times 2^{10}\text{B}$$

$$\Rightarrow 144 \times 2^{10}\text{B} + 26 \times 2^{19}\text{B} + 9 \times 2^{18} \times 12 \times 2^{10}\text{B}$$

$$\Rightarrow 144 \times 2^{10} + 9 \times 2^{21}\text{B} + 27 \times 2^{30}\text{B} \cong 27\text{ GB}$$

C 30 GB

D 31 GB

QUESTION ANALYTICS +

Q. 12 FAQ | Solution Video | Have any Doubt ?

Consider the main memory with 5 page frames and the following sequence of page references : 9, 8, 7, 9, 3, 0, 2, 9, 8, 3, 9, 2, 0, 9.
Then the result of X + Y is _____ (where X is number of page faults using LRU policy and Y is number of page faults using FIFO policy).

A 14

B 15 — Your answer is Correct

Solution :
(b)
Using LRU:

9	8	7	9	3	0	2	9	8	3	9	2	0	9
					0	0	0	0	0	0	0	0	0
				3	3	3	3	3	3	3	3	3	3
		7	7	7	7	7	7	8	8	8	8	8	8
	8	8	8	8	8	2	2	2	2	2	2	2	2
9	9	9	9	9	9	9	9	9	9	9	9	9	9
F	F	F		F	F	F		F					

= 7 faults

By using FIFO:

9	8	7	9	3	0	2	9	8	3	9	2	0	9
					0	0	0	0	0	0	0	0	0
				3	3	3	3	3	3	3	3	3	3
		7	7	7	7	7	7	8	8	8	8	8	8
	8	8	8	8	8	8	9	9	9	9	9	9	9
9	9	9	9	9	9	2	2	2	2	2	2	2	2
F	F	F		F	F	F	F	F					

= 8 faults

C 16

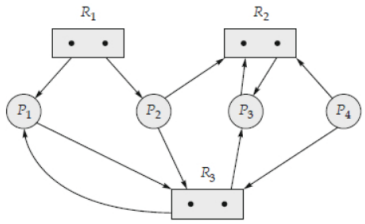
D 17

QUESTION ANALYTICS +

Q. 13

FAQ | Solution Video | Have any Doubt ?

Consider the following resource allocation graph with four processes P_1, P_2, P_3, P_4 and three resources R_1, R_2, R_3.
System has two instance of R_1, R_2 and R_3 respectively.



Which of the following statement is correct for the above systems?

A No safe sequence exist

B Exactly two safe sequence

C Exactly one safe sequence exists

D More than two safe sequence exists — Your answer is **Correct**

Solution :
(d)

Process	Allocated			Need		
	R_1	R_2	R_3	R_1	R_2	R_3
P_1	1	0	1	0	0	1
P_2	1	0	0	0	1	1
P_3	0	1	1	0	1	0
P_4	0	0	0	0	1	1

$$\text{Available} = \begin{matrix} R_1 & R_2 & R_3 \\ (0 & 1 & 0) \end{matrix}$$

P_3 need = (0, 1, 0) so P_3 can execute, after that available resources (0, 2, 1).
Now, anyone of P_1 or P_2 or P_4 can execute.

QUESTION ANALYTICS +

Q. 14

FAQ | Solution Video | Have any Doubt ?

Consider a computer system with 32 bit virtual addressing and 44 bit physical addressing with page size 4 KB. Each page table entry contain 2 valid bit, 3 protection bit and 2 permission bit. The approximate size of the page table when virtual memory uses single level paging _____ (MB).

5 — Correct Option

Solution :
5

$$\text{Number of pages} = \frac{\text{Virtual address space}}{\text{Page size}} = \frac{2^{32}}{2^{12}} = 2^{20}$$

$$\text{Number of frames} = \frac{2^{44}}{2^{12}} = 2^{32}$$

Therefore number of bits in page table entry
= 32 + 2 valid bit + 2 protection bit + 2 permission bit
= 39 bit = 5 B

Page table size = Number of entries × PTE size
= 2^{20} × 5 B = 5 MB

Your Answer is 4.875

QUESTION ANALYTICS +

Q. 15

FAQ | Solution Video | Have any Doubt ?

Consider a 2-level paging hardware with TLB. Assume that the entire page table and all the pages are in the physical memory. It takes 50 µs to search the TLB and 40 milliseconds to access the physical memory. If the TLB hit ratio is 0.6 and there are no page faults, the effective memory access time (in milliseconds) is _____. (Upto 2 decimal places)

72.05 [72.04 - 72.06] — Correct Option

Solution :
72.05 [72.04 - 72.06]

$$\begin{aligned}
\text{TLB access time } (t) &= 50\ \mu s \\
\text{Memory access time } (m) &= 40\ \text{msec} = 40000\ \mu s \\
\text{TLB miss rate } (p) &= 0.3 \\
\text{Level of paging } (k) &= 2 \\
\text{Effective access time} &= \text{TLB hit (TLB time + Main memory time) + TLB miss} \\
&\quad \text{(TLB time + 3 × Main memory time)} \\
&= 0.6\ [50 + 40000] + 0.4\ (50 + 3 \times 40000) = 24030 + 48020 \\
&= 72050\ \mu s = 72.050\ ms
\end{aligned}$$

Your Answer is 72.50

QUESTION ANALYTICS +

Q. 16 FAQ | Solution Video | Have any Doubt ?

Which of the following are ways to make file systems faster?

A. Put parts of a file on many different tracks so part of it can be accessed no matter where the disk head is.

B. Cache frequently used blocks in memory so they can be accessed at memory speeds instead of disk speeds. — Your option is **Correct**

C. Use a disk scheduling algorithm to minimize the distance between seeks. — Your option is **Correct**

D. Put frequently used files or directories near the center of the disk so on average they won't be far from the read head. — Your option is **Correct**

YOUR ANSWER - b,c,d | CORRECT ANSWER - b,c,d | STATUS - ✓

Solution :
(b, c, d)
• Putting parts of file on different tracks will increase the latency so (a) is not correct answer.
• Using locality of reference will make file systems faster.

QUESTION ANALYTICS +

Q. 17 Solution Video | Have any Doubt ?

Which of the following are problems of contiguous allocation?

A. Finding space for a new file — Your option is **Correct**

B. Compaction requirement — Your option is **Correct**

C. External fragmentation — Your option is **Correct**

D. Paging

YOUR ANSWER - a,b,c | CORRECT ANSWER - a,b,c | STATUS - ✓

Solution :
(a, b, c)
• Paging is not a problem of contiguous allocation.
All others are caused due to contiguous allocation.

QUESTION ANALYTICS +